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PARMOPS CORUSCANS, A NEW GENUS AND SPECIES OF FLASHLIGHT FISH (BERYCIFORMES: ANOMALOPIDAE) FROM THE SOUTH PACIFIC

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Abstract.—*Parmops coruscans,* new genus, new species, is described from a single specimen taken in 350 m at Tahiti. It is distinguished from other anomalopids by having the first four infraorbital bones expanded laterally to form a shelf beneath the eye. The light organ of *P. coruscans* is rotatable, and there is an erectile shutter. The shutter mechanism in *Parmops* is the least developed of all anomalopids.

The family Anomalopidae is a small circumtropical group of nocturnal neritic beryciform fishes. The most conspicuous defining character of the group is the presence of a luminous organ beneath the eye in which symbiotic luminous bacteria are cultured (Harvey 1922). The bacteria glow continuously, and the light organ is occluded mechanically, either by rotation of its luminous face downward or by the erection of a black elastic membrane upward over it (Johnson & Rosenblatt 1988).

The family was reviewed recently by McCosker & Rosenblatt (1987), who recognized five species in three genera and elevated the subspecies *Photoblepharon palpebratum steinitzi* to specific rank. Those authors noted the presence of two forms in the Indo-Australian area, *P. palpebratum* and *Anomalops katoptron.* Subsequently, Johnson & Rosenblatt (1988) described the mechanisms of light organ occlusion, discussed the evolution of these mechanisms in light of an hypothesized generic phylogeny, and erected a new genus, *Phthanophaneron,* for the eastern Pacific *Kryptophanaron harveyi.*

The fish collection of the Bernice P. Bishop Museum (BPBM) contains a single anomalopid specimen collected in deep water at Tahiti that cannot be assigned to any known species. Our examination of that specimen indicates that it represents a clade between *Anomalops* and *Phthanophaneron* within the phylogeny proposed by Johnson & Rosenblatt (1988, fig. 10), and thus should be placed in a new genus.

Whether the new species is restricted to deep water or, like *Kryptophanaron alfredi* and *Anomalops katoptron,* has a broad depth distribution, remains to be determined, along with all other aspects of its biology. The purpose of this paper is to describe the new species and discuss its relationships within the Anomalopidae. Methods and terminology are those of Rosenblatt & Montgomery (1976) and Johnson & Rosenblatt (1988) for external and light organ occlusion morphology, respectively.

Parmops, new genus
Figs. 1–3, Tables 1, 2

Diagnosis.—An anomalopid with the dorsolateral margins of the first four infraorbital bones expanded to form a medially sloping shelf that protrudes laterally well beyond the perimeter of the orbit, a spinous dorsal fin, two anal-fin spines, a pelvic-fin spine, a row of enlarged scutes on the belly, a fully rotatable light organ and an elastic shutter that lies flat on the floor of the orbit when relaxed.

Type species.—*Parmops coruscans,* new species.

Etymology.—From the Greek *parme,* a small shield, and *ops,* eye, in reference to the expanded infraorbitals. Gender masculine.

Parmops coruscans, new species
Figs. 1, 2, Tables 1, 2

Holotype.—BPBM 30885. A 48.2 mm SL immature individual taken 11 Aug 1985 outside the reef at Punnauia, Tahiti, Society Islands, from the stomach of a grouper, *Saloptia powelli,* caught at 350 m by "Fuller and Faty."

Description.—Counts and measurements, in mm, of the holotype: Dorsal-fin rays V—I,16; anal-fin rays II,12; pectoral-fin rays ii14i; pelvic-fin rays I,5; caudal-fin rays 10, 10+9, 10; branchiostegals 8; gill rakers 8+22; pored lateral-line scales 30; scale rows above lateral line 8; abdominal scutes 9; vertebrae 14+16. Head length 18.8; predorsal length 21.4; prepelvic length 18.6; body depth 19.1; caudal-peduncle depth 10.1; caudal-peduncle length 13.9; snout length 17.7; eye 9.0; orbit 9.4; light-organ length 6.7; light organ depth 2.6; pectoral-fin length 12.5; pelvic-fin length 9.2; first dorsal-spine length 2.9; fifth dorsal-spine length 4.4.

Body compressed, width 3.2 in depth. Back somewhat elevated, body depth 1.5 in length without head. Snout blunt, profile sloping forward without much curvature from occiput to before eye, then descending convexly to rostrum. Nostrils just before eye, anterior with thickened posterior rim. Mouth oblique, tip of lower jaw about ¼ of eye height above lower margin of eyeball, upper jaw slightly included. Maxilla extending posteriorly to about middle of eye. Posterior supramaxilla ovoid with an anterior process, covering all but posteroventral corner of maxilla. Anterior supramaxilla substantially smaller with no anteriorly directed process. Premaxillae with pronounced notch at symphysis into which lower jaw fits. Jaw teeth in bands, premaxillae with uniformly small teeth, dentaries with anterior patches of enlarged teeth that extend outside mouth. Vomer toothless, palatines with bands of teeth similar to smaller jaw teeth.

Bones of head and shoulder girdle strongly sculptured, with numerous spine-bearing ridges. Cleithrum broadly exposed, dorsal expansion with serrate posterior margin. Supracleithrum exposed, its posterior margin weakly denticulate. Infraorbitals 1–4 enlarged and laterally flared to form medially sloping shelf effectively deepening subocular pocket that accommodates light organ. Laterosensory canals of head developed as broad troughs with bony bridges. Lacrimal with three pores anteriorly followed by two larger cavities covered with smooth black membrane without papillae or pores. Postorbital canal with two bony bridges delineating three membrane-roofed spaces. Preopercular canal with two bony bridges near angle. Mandibular canal with two pores through bone anteriorly, followed posteriorly by long trough with two bony bridges near junction with preopercular canal. Canals of cranium covered by skin that appears smooth and entire, except for two lateral and one medial frontal pores above orbit, two small pores on supraorbital canal, and small temporal pore on right side. Eye prominent, its diameter about equal to postorbital head length. Much of cornea black, with subspherical clear window 6.0 mm long by 5.0 mm high. Pupil 4.0 mm in diameter. Single fleshy tubercle on posterior margin of eye on level with lower margin of pupil. Ovoid luminous organ below eye, free except at anterior end, rotatable so that luminous face can be rotated downward into pocket formed by flared infraorbitals. Outer margin of adpressed organ well below infraorbital rim. Black elastic shutter membrane attached along lateral margin of suborbital pocket, lying flat on floor of pocket when relaxed, with free margin directed medially.

Scales strongly ctenoid (ct′ of Johnson

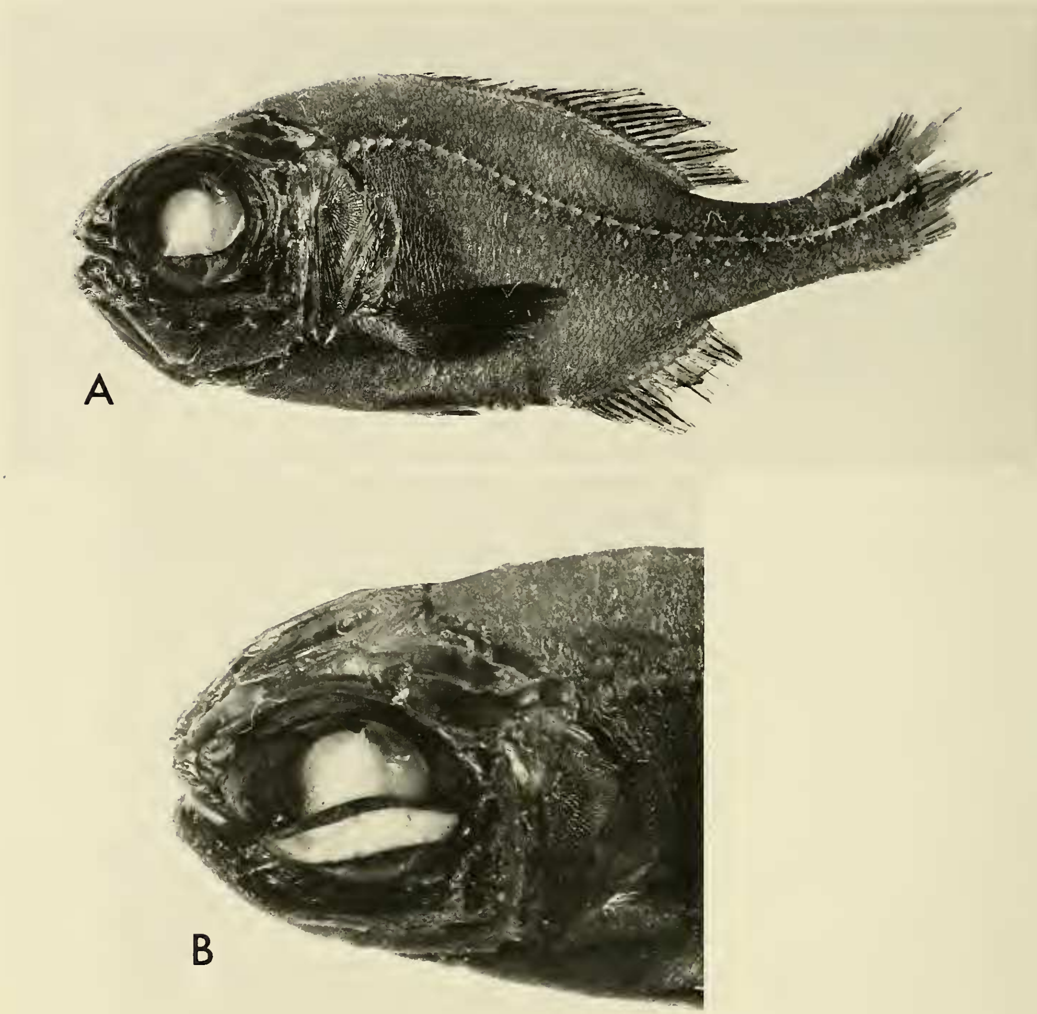

Fig. 1. Holotype of *Parmops coruscans,* BPBM 30885. A. Whole specimen in lateral view, light organ occluded. B. Head in dorsolateral view, light organ exposed.

1984), small, and difficult to enumerate because of irregular arrangement, approximately 100 lateral body rows. Head scaleless except for a few irregular scales at anterodorsal corner of opercle, along preopercle and on cheek. Gular isthmus naked, with transverse fleshy ridges. No cycloid scales on body. Scale sheaths well-developed at bases of dorsal and anal fins. Midventral row of 9 enlarged keeled scales (scutes) along abdomen.

Gill rakers on first arch well developed, lath-like; length of first raker below angle about ½ eye diameter; rakers becoming shorter on succeeding arches, those on last arch nubbins. Pseudobranch well developed, with about 18 filaments, longest slightly longer than filaments of first gill arch.

Spinous dorsal fin relatively low, first spine about half length of succeeding four, which are subequal. Dorsal and anal soft rays mostly broken. First anal spine about

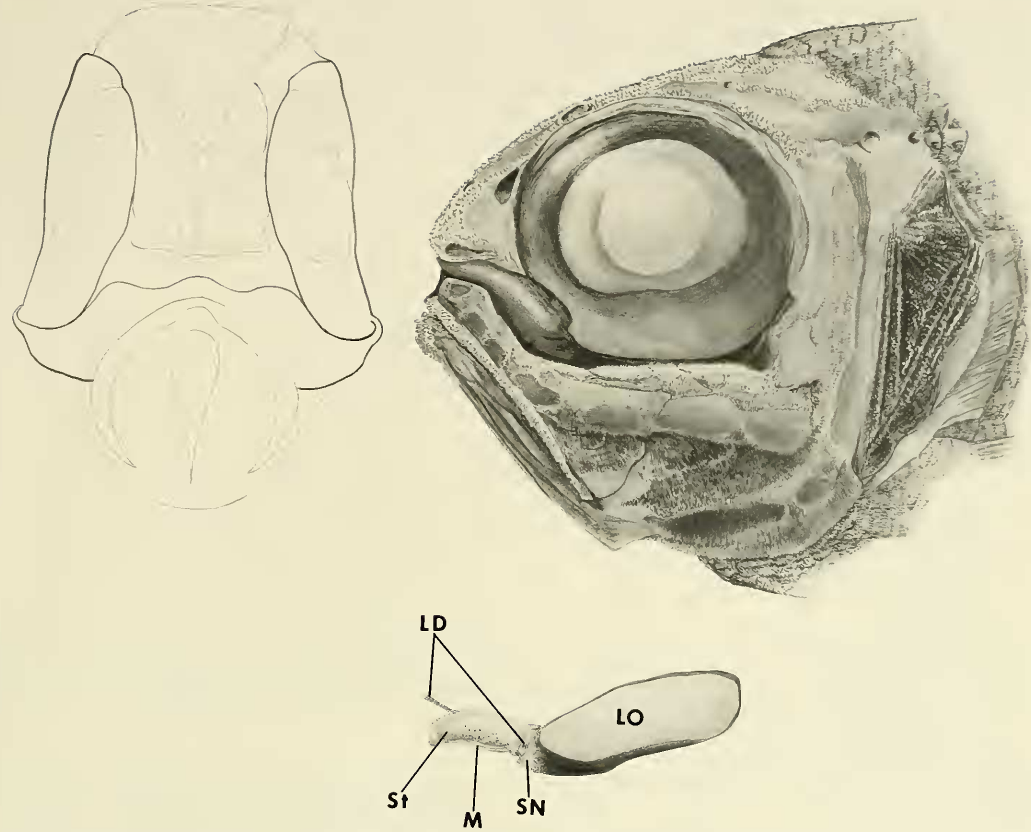

Fig. 2. Holotype of *Parmops coruscans.* Head, light organ occluded, with outline of frontal view to left and light organ and associated structures, removed, below: LD, Ligament of Diogenes; LO, light organ; M, stalk muscle; SN, rudiment of shutter knob; ST, stalk.

equal in length to first dorsal spine. Second anal-fin ray a spine in transition, segmented at tip. Caudal-fin rays broken.

Pectoral fin angulate, length about 1.5 in head, third through sixth rays subequal and longest. Pelvic fin shorter than pectoral, extending to within 0.4 eye diameter of anal-fin origin. Color black, fins and lower part of head darkest. Lateral line conspicuously paler than rest of body.

Etymology.—From the Latin *coruscans,* sparkling, in reference to the subocular light organ.

Occlusion mechanism.—The light organ, stalk and supporting cup are shown in Fig. 2. The light organ is borne on a fibrocartilage stalk that is continuous across the snout with no attenuation at the commissure. Posteriorly the stalk articulates loosely with the supporting fibrocartilage cup of the organ and is attached to it by two short ligaments. The anteroventral corner of the cup extends forward as a short process that is connected directly by one of the short ligaments to the posteroventral corner of the stalk, which bears no ventral hook. There is no discrete shutter knob, but there is a slight thickening at the anterodorsal corner of the shutter. The cup is a crescentic structure that embraces the anterior end of the light organ and extends posteriorly along about two-thirds of its ventral surface. Anteriorly, the cup is expanded as a medially projecting shelf. The stalk muscle is relatively small,

Table 1.—States of characters not associated with light-organ complex in *Parmops.* (Characters numbered as in Johnson & Rosenblatt 1988).

1	Epipleural ribs	2
2	Branchiostegals	Spiny
3	Openings in pars jugularis	?
4	Parasphenoid flanges	?
5	Swimbladder stay	—
6	Postorbital papillae	1
7	Cephalic sensory canal covering	Smooth**
8	Lateral-line tubes	Closed
9	Midventral scutes	Continuous
10	Dorsal Fin / Predorsals	V–I, 16 / 0/0/1+1/
11	Supramaxillae	2*
12	Transverse ridges on gular isthmus	+*
13	Lateral dentary tooth patch	Large "V"*
14	Body scale rows	ca. 100*
15	Reflective or transparent lateral line scales	+*
16	Pelvic spine	+
17	Anal spines	II
18	Vertebrae	14+16
19	Corner of maxilla	Smooth

* Derived states shared with *Phthanophaneron* (lacks 15), *Kryptophanaron,* and *Photoblepharon.*
** Derived state shared as a homoplasy with *Kryptophanaron.*

Table 2.—Light-organ associated character states in *Parmops.* (Characters numbered as in Johnson & Rosenblatt 1988).

I	Attachment of LD on cup	Lateral
II	Attachment of LD anteriorly	Maxilla
III	Cup with medial shelf	Moderate
IV	Insertion of stalk muscle dorsally	Ligament to cup
V	Stalk with inward flexure at cup articulation	—
VI	Rotation pad	—
VII	Postocular skin flap	—
VIIIa	Erectile shutter	+*
VIIIb	Shutter knob	—
IX	Stalk hook	—
X	Stalk continuous across snout	+*
XIa	EM with groove	+*
XIb	EM with medial swelling	—
XII	Hook and shutter knob intimately associated	NA
XIII	Cup process attached to stalk hook by ligament	NA
XIV	Organ rotatable	+

* Derived states, all shared with *Phthanophaneron, Kryptophanaron,* and *Photoblepharon.*

with little differentiation between the dorsal portion, which inserts on the dorsal ligament that connects the cup and stalk, and the ventral portion, which inserts on the articular termination of the stalk. The Ligament of Diogenes attaches to the anteromedial corner of the cup shelf and runs anterodorsally, passes over a slight groove in the ethmomaxillary ligament at its forward flexure, and inserts on the lateral face of the rostral cartilage. The ethmomaxillary ligament originates dorsally on the mesethmoid and extends ventrally, flexes anteroventrally at the groove, and then passes around the cartilaginous tip of the palatine to insert on the ventrolateral margin of the maxilla just ventral to its head. The groove in the ethmomaxillary ligament is weakly developed and there is no notable swelling on the medial surface of the latter. The ethmomaxillary ligament branches just dorsal to its insertion on the maxilla, giving rise to a broader but thinner segment that passes ventrally to insert on the palatine.

Relationships.—In physiognomy, *Parmops* most closely resembles *Phthanophaneron,* and this similarity is reflected in the primitive nature of the light occlusion mechanism as well. Table 1 lists characters not associated with the light organ mechanism and Table 2 lists those that are. Our hypothesis of relationships based on these characters is presented in Fig. 3. Among the characters not associated with the light organ mechanism, *Parmops* shares five derived states with the *Phthanophaneron-Kryptophanaron-Photoblepharon* (hereafter *P.-K.-P.*) clade and none with *Anomalops.* For one of those five apomorphies, the presence of reflective or transparent lateral-line scales (character 15), there is an alternative interpretation equally parsimonious to the topology shown on the cladogram, i.e., independent acquisition in *Parmops* and at the *K.-P.* node rather than reversal in

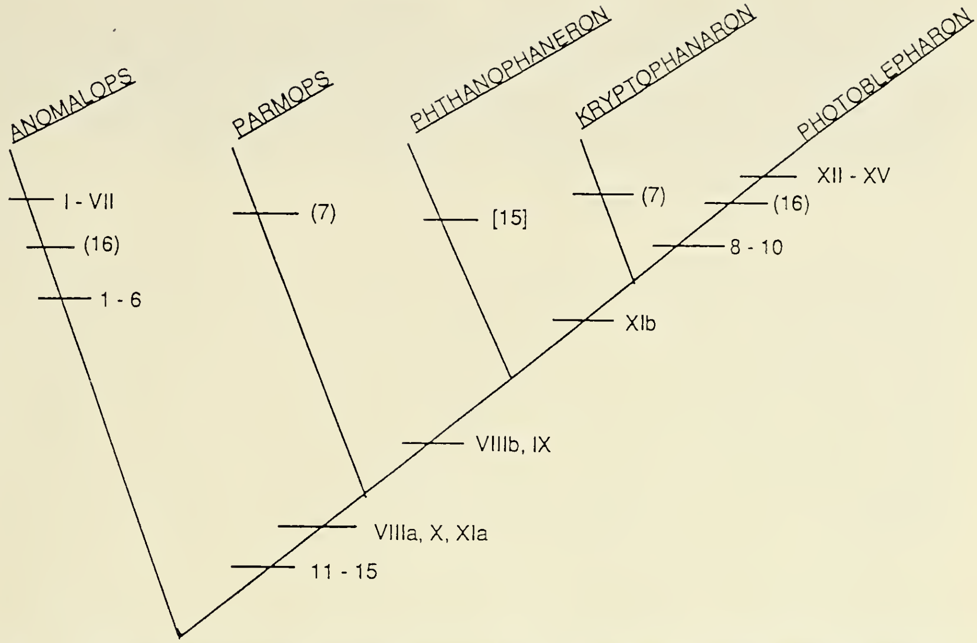

Fig. 3. Cladogram of anomalopid genera. Characters as in Tables 1 and 2. Parentheses and brackets respectively denote hypothesized independent acquisitions and reversals.

Phthanophaneron. Of the light-organ associated characters, *Parmops* shares three, an erectile shutter, a continuous stalk, and a groove in the ethmomaxillary ligament, with the *P.-K.-P.* clade. *Parmops* is primitive with respect to members of that clade in two states, absence of a stalk hook and shutter knob. *Parmops* is thus placed at the base of the shutter-mechanism lineage, as the sister group of the *P.-K.-P.* clade. These four genera ostensively provide a rare illustration of the gradual evolutionary elaboration of a functional complex, in which each genus exhibits a slightly more intricate and integrated linkage system to effect shutter erection.

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